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Daniel Pulu Poenar

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EXAMINER

QUINTO, KEVIN V

ART UNIT

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2826

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/587,493	Applicant(s) POENAR ET AL.	
	Examiner Kevin Quinto	Art Unit 2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 April 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 and 28-41 is/are pending in the application.
- 4a) Of the above claim(s) 5,9-27 and 29-31 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4,6-8,28,32-35 and 39-41 is/are rejected.
- 7) ☒ Claim(s) 36-38 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 July 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>12 December 2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Claims 9-18, 22-26, 29-31 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected species, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on April 5, 2010. The traversal is on the ground(s) that claims 1-41 relate to a single inventive concept since the claims require a JFET structure which relies on junctions as well as current flow through the channel. This is not found to be persuasive because the below rejection cites prior art references which have a JFET with the claimed junctions and current flow. The requirement is still deemed proper and is therefore made FINAL.

2. The applicant has elected the species presented in figure 1A. However figure 1A only has four electrical interconnects which are on the same side of the substrate while claim 5 requires three electrical interconnects that are on one side of the substrate with the fourth electrical interconnect being on the other side of the substrate. In addition, claim 19 recites a semiconductor device with a channel, a source region, and a drain region which are each at three different depths. Figure 1A only shows a semiconductor device with a channel at one depth while the source and drain regions are at the same depth. Therefore claims 5 and 19-21 are withdrawn from consideration as being directed to non-elected species. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 3, 4, and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Wade (USPN 4,241,358).

5. In reference to claim 1, Wade (USPN 4,241,358) discloses a device which meets the claim. Figure 2 of Wade discloses a semiconductor device comprising a substrate having a surface. There is a first pn-junction (14, 12) defining a first depletion region formed on the substrate at a first depth relative to the surface. There is a second pn-junction (34, 12) defining a second depletion region formed on the substrate at a second depth relative to the surface deeper than the first depth. A doped, photo-conductive channel is formed on the substrate between the first and second pn-junctions. Patrin (USPN 3,985,449) discloses that it is well known that different colors or wavelengths of radiation penetrate to different depths in the semiconductor (column 1, lines 50-57). Thus the first and second depths inherently generate charge carriers in the first depletion region in response to light of a first wavelength band incident on the surface as well as charge carriers in the second depletion region in response to light of a second wavelength band incident on the surface in addition to charge carriers in the channel in response to light of a third wavelength band incident on the surface. There are doped drain (20) and source (16) regions on the substrate in communication with

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the channel. There are first (18) and second (22) electrical interconnects in communication with the source (16) and drain (20) regions respectively. There are third (24) and fourth (32) electrical interconnects in communication with the first and second pn-junctions respectively. Incident light on the surface at the first, second, and third wavelength bands are detectable through currents through said first, second, third and fourth electrical contacts.

6. In reference to claim 3, the substrate comprises a wafer while the channel (12) is on the wafer. Wade does not disclose that the channel is epitaxially grown. However this places the claim into the form of a **product-by-process claim**:

Note that a "product by process" claim is directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See also *In re Thorpe*, 227 USPQ 964, 966; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wertheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and *In re Marosi et al.*, 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear. See also MPEP 2113.

Claim 3 is not patentably distinguishable from the Wade reference regardless of the process used to form the channel, because only the final product is relevant, and not the process of making such as epitaxial growth.

7. With regard to claim 4, the electrical interconnects (18, 24, 22, and 32) and the surface are on the same side of the substrate.

8. In reference to claim 6, there is a top gate region (14) adjoining the channel forming the first pn-junction and a bottom gate region (30) adjoining the channel forming the second pn-junction. The channel is doped of a first conductive type while the gate

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regions (14, 30) are doped of an opposite, second conductive type, thus forming a junction field-effect transistor (JFET) on the substrate.

9. Claims 1, 3, 4, 6, 32-35, 39, and 41 are rejected under 35 U.S.C. 102(b) as being anticipated by Wolffenbuttel (USPN 4,749,851).

10. In reference to claim 1, Wolffenbuttel (USPN 4,749,851) discloses a device which meets the claim. Figures 11a-11b, 14a-14b, 15a-15b, and 16a-16b disclose a semiconductor device comprising a substrate having a surface. There is a first pn-junction defining a first depletion region formed on the substrate at a first depth relative to the surface. There is a second pn-junction defining a second depletion region formed on the substrate at a second depth relative to the surface deeper than the first depth. A doped, photo-conductive channel (13, 31, 71, 91, 102) is formed on the substrate between the first and second pn-junctions. The first and second depths are chosen to generate (i) charge carriers in the first depletion region in response to light of a first wavelength band incident on the surface, (ii) charge carriers in the second depletion region in response to light of a second wavelength band incident on the surface, and (iii) charge carriers in the channel in response to light of a third wavelength band incident on the surface (see abstract). There are doped drain (16, 36, 76, 96, 109) and source (15, 35, 75, 95, 108) regions on the substrate in communication with the channel. There are first (20, 40, see solid black blocks on elongated regions in all other figures) and second (19, 39, see solid black blocks on elongated regions in all other figures) electrical interconnects in communication with the source (15, 35, 75, 95, 108) and drain (16, 36, 76, 96, 109) regions respectively. There are third (21, 41a-41c, see also solid black

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blocks) and fourth (18, 38, see also solid black blocks) electrical interconnects in communication with the first and second pn-junctions respectively. Incident light on the surface at the first, second, and third wavelength bands are detectable through currents through the first, second, third and fourth electrical contacts.

11. In reference to claim 3, the substrate is a semiconductor wafer with the channel being epitaxially grown on the wafer (column 9, lines 50-56).

12. With regard to claim 4, the electrical interconnects and the surface are on the same side of the substrate.

13. In reference to claim 6, there is a top gate region (13) adjoining the channel forming the first pn-junction and a bottom gate region (17) adjoining the channel forming the second pn-junction. The channel is doped of a first conductive type (n-type) while the gate regions (14, 17) are doped of an opposite, second conductive type (p-type), thus forming a junction field-effect transistor (JFET) on the substrate.

14. In reference to claim 32, Wolffenbuttel (USPN 4,749,851) discloses a method which meets the claim. Figures 5a-5b, 11a-11b, 14a-14b, 15a-15b, and 16a-16b of Wolffenbuttel disclose a method of photo-sensing which comprises biasing a junction field effect transistor (JFET) to generate a conducting channel between a source (15, 35, 75, 95, 108) and a drain (16, 36, 76, 96, 109) of the JFET. The conducting channel has an absorption section below a light-transmitting surface of the JFET. The absorption section has a pre-determined photo-conductivity spectral response and at least two depleted regions (noted by the dotted lines within the substrate) below the light-transmitting surface which each has a photo-electric spectral response peaking at

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a distinct, pre-determined wavelength. The light-transmitting surface is illuminated with light. An output signal is sensed which is derived from the channel indicative of the intensity of absorbed light. For each particular one of the depleted regions, an output signal is sensed which derived from the particular depleted region indicative of the intensity of absorbed light.

15. With regard to claim 33, the one or more depleted regions comprise two depleted regions at different depths below the light-transmitting surface.

16. In reference to claim 34, the sensing of the output signal comprises sensing a current (abstract, column 7, lines 25-28).

17. With regard to claim 35, the sensing of an output signal comprises sensing a drain-source current from the drain to the source through the conducting channel while the sensing of an output signal derived from the particular depleted region comprises sensing a gate current from a gate (13) in contact with the particular depleted region.

18. In reference to claim 39, pre-determined wavelengths are selected such that a plurality of different spectral components of the light can be determined from the output signals. These spectral components comprise blue, green, and red components (column 3, lines 19-23).

19. With regard to claim 41, figure 2b discloses the detection of a blue component which covers wavelengths below about 500 nm. Figure 3 also discloses the detection of a blue component which covers wavelengths below about 500 nm, as well as a green component which covers wavelengths from about 500 to about 600 nm, and a red component which covers wavelengths above about 600 nm.

Claim Rejections - 35 USC § 103

20. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

21. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wade (USPN 4,241,358) in view of Patrin (USPN 3,985,449).

22. In reference to claim 2, Wade does not disclose the exact depths for the first and second pn junctions. However Patrin (USPN 3,985,449) makes it clear that the depth is result effective variable since different colors or wavelengths of radiation penetrate to different depths in a semiconductor (column 1, lines 50-57). It would have been obvious to one having ordinary skill in the art at the time of the invention was made to adjust the depths of the first and second pn junctions, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). Therefore this claim is not patentable over Wade and Patrin.

23. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wade (USPN 4,241,358)

24. With regard to claim 7, the first conductive type is n-type. Wade does not disclose the exact doping concentrations for the channel, the top gate, and the bottom gate. However:

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"[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Thus claim 7 is not patentable over Wade.

25. With regard to claim 8, the source (16) and drain (20) regions are of the first conductive type. Wade does not disclose the exact doping concentrations for the source and the drain regions. However:

"[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Thus claim 8 is not patentable over Wade.

26. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wade (USPN 4,241,358) in view of Kuijk et al. (USPN 6,157,035).

27. In reference to claim 28, Wade does not disclose forming a plurality of photo-sensing units shown in figure 2 to form a photo-sensing device. However Kuijk et al. (USPN 6,157,035, hereinafter referred to as the "Kuijk" reference) discloses the known use of a plurality of photo-sensing units to form a photo-sensing device (column 1, lines 13-67, column 2, lines 1-12). Furthermore Kuijk makes it clear that faster turn-off times are desired in photo-sensing devices (column 2, lines 19-20). Wade makes it clear that the photo-sensing unit in figure 2 has the benefit of a fast turn-off time (column 1, lines 40-42). In view of Kuijk, it would therefore be obvious to use a plurality of the photo-sensing units shown in figure 2 of Wade to form a photo-sensing device.

28. Claim 2, 7, 8, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wolffenbuttel (USPN 4,749,851).

29. In reference to claim 2, Wolffenbuttel does not disclose the exact depths for the first and second pn junctions. However Wolffenbuttel makes it clear that the depth is

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result effective variable since different colors or wavelengths of radiation penetrate to different depths in a semiconductor (figures 2b, 2c, and 3, also column 5, lines 19-28).

It would have been obvious to one having ordinary skill in the art at the time of the invention was made to adjust the depths of the first and second pn junctions, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Therefore this claim is not patentable over Wolffenbuttel.

30. With regard to claim 7, the first conductive type is n-type. Wolffenbuttel does not disclose the exact doping concentrations for the channel, the top gate, and the bottom gate. However:

"[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Thus claim 7 is not patentable over Wolffenbuttel.

31. With regard to claim 8, the source and drain regions are of the first conductive type. Wolffenbuttel does not disclose the exact doping concentrations for the source and the drain regions. However:

"[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Thus claim 8 is not patentable over Wolffenbuttel.

32. In reference to claim 28, Wolffenbuttel does not disclose forming a plurality of photo-sensing units to form a photo-sensing device. However it would have been obvious to one having ordinary skill in the art at the time the invention was made to form more than one photo-sensing unit, since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. Mere duplication

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of parts has no patentable significance unless a new and unexpected result is produced. In re Harza, 274 F.2d 669, 124 USPQ 378 (CCPA 1960). Thus claim 28 is not patentable over Wolffenbuttel.

Allowable Subject Matter

33. Claims 36-38 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

34. The following is a statement of reasons for the indication of allowable subject matter: the examiner is unaware of any prior art which suggests or renders obvious a method of photo-sensing which comprises biasing a junction field effect transistor with a channel between a source and a drain, at least two depletion regions, sensing an output signal from the channel, sensing output signals from the depletion regions with the suggested drain-source photo-induced current sensing variation as explicitly described by the applicant in claims 36, 37, and 38.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Quinto whose telephone number is (571) 272-1920. The examiner can normally be reached on M-F 8AM-5PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on (571) 272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kevin Quinto/
Examiner, Art Unit 2826

/Evan Pert/
Primary Examiner, Art Unit 2826